

WHAT IS CLAIMED IS:

- 1 1. A spinal stabilization system comprising:
 - 2 (a) a stabilizing element comprising a first segment and a second
3 segment, the first and second segments connected by a pivoting joint;
 - 4 (b) a first connector adapted to connect the stabilizing element to a
5 first vertebra in a spinal column;
 - 6 (c) a second connector adapted to connect the stabilizing element
7 to a second vertebra in the spinal column; and
 - 8 (d) a disc prosthesis or a disc nucleus replacement disposed
9 between two adjacent vertebrae in the spinal column.
- 1 2. The spinal stabilization system of claim 1, wherein the
2 stabilizing element is a rod.
- 1 3. The spinal stabilization system of claim 1, wherein the
2 stabilizing element is a plate.
- 1 4. The spinal stabilization system of claim 1, wherein the first and
2 second connectors comprise pedicle screws, lateral mass screws or hooks.
- 1 5. The spinal stabilization system of claim 1, wherein the first
2 segment comprises a proximal end defining a generally spherical socket and the
3 second segment comprises a proximal end comprising a spherical ball adapted to fit
4 into the socket to provide a ball-and-socket type joint.
- 1 6. The spinal stabilization system of claim 1, wherein the
2 generally spherical socket comprises a flat strip running laterally around its
3 midsection.
- 1 7. The spinal stabilization system of claim 1, wherein:
 - 2 (a) the first segment comprises a socket extending into its proximal
3 end, the socket defined, at least in part, by two opposing concave surfaces separated
4 by a gap; and

5 (b) the second segment comprises an insert formed on a neck at its
6 proximal end, the insert comprising two opposing convex surfaces;
7 wherein the insert fits into the socket to provide a pivoting joint.

1 8. The spinal stabilization system of claim 7, wherein the two
2 opposing concave surfaces each comprises a flat strip extending laterally along at
3 least a portion of the apex of concavity.

1 9. The spinal stabilization system of claim 7, further comprising a
2 damping element disposed around the neck.

1 10. The spinal stabilization system of claim 7, wherein the socket is
2 characterized by a central axis and further wherein the socket is further defined by a
3 housing centered on its central axis and opening into the gap, the spinal stabilization
4 system further comprising a damping element disposed within the housing.

1 11. The spinal stabilization system of claim 7, wherein the central
2 axis of the socket is not parallel to the longitudinal axis of the stabilizing element.

1 12. The spinal stabilization system of claim 1, further comprising:
2 (a) a second stabilizing element comprising a third segment and a
3 fourth segment, the third and fourth segments connected by a pivoting joint;

4 (b) a third connector adapted to connect the second stabilizing
5 element to the first vertebra; and

6 (c) a fourth connector adapted to connect the second stabilizing
7 element to the second vertebra.

1 13. The spinal stabilization system of claim 12, further comprising
2 a transverse connector connecting the first stabilizing element to the second
3 stabilizing element.

1 14. The spinal stabilization system of claim 13, wherein the
2 transverse connector comprises a first segment and a second segment, the first and
3 second segments connected by a pivoting joint.

1 15. The spinal stabilization system of claim 1, further comprising a
2 tissue growth-resistant material disposed around the pivoting joint.

1 16. The spinal stabilization system of claim 1, wherein the first and
2 second segments are comprised of a plurality of interconnecting sections.

1 17. The spinal stabilization system of claim 1, further comprising
2 one or more prosthetic vertebral bodies disposed within the spinal column.

1 18. The spinal stabilization system of claim 1, further comprising:

2 (a) a socket extending into a proximal end of the first segment;

3 (b) a pin extending outwardly from a proximal end of the second
4 segment, the pin comprising a distal end and a collar extending radially outwardly
5 from the pin; and

6 (c) a first damping element disposed around the pin above the
7 collar and a second damping element disposed around the pin below the collar;

8 wherein the pin and the first and second damping elements extend into
9 the socket to form a joint allowing multidirectional pivoting of the pin in the socket.

1 19. The spinal stabilization system of claim 7, wherein the one of
2 the first or second segments comprises at least one tab extending outwardly from its
3 proximal end, the at least one tab defining a window, and the other of the first or
4 second segment comprises at least one arm extending outwardly from its proximal
5 end and through the window of the at least one tab.

1 20. The spinal stabilization system of claim 19, further including at
2 least one damping element disposed around the at least one arm.

1 21. A spinal stabilization element comprising:

2 (a) a first segment comprising a socket extending into its proximal

3 end, the socket defined, at least in part, by two opposing concave surfaces separated
4 by a gap;

5 (b) a second segment comprising an insert formed on a neck at a
6 proximal end of the second segment, the insert comprising two opposing convex
7 surfaces;

8 (c) a first connector adapted to connect the stabilizing element to a
9 first vertebra in a spinal column; and

10 (d) a second connector adapted to connect the stabilizing element
11 to a second vertebra in the spinal column;

12 wherein the insert fits into the socket to provide a pivoting joint.

1 22. The spinal stabilization system of claim 21, wherein the two
2 opposing concave surfaces each comprises a flat strip extending laterally along at
3 least a portion of the apex of concavity.

1 23. The spinal stabilization system of claim 21, further comprising
2 a damping element disposed around the neck.

1 24. The spinal stabilization system of claim 21, wherein the socket
2 is characterized by a central axis and further wherein the socket is further defined by a
3 housing centered on its central axis and opening into the gap, the spinal stabilization
4 system further comprising a damping element disposed within the housing.

1 25. The spinal stabilization system of claim 21, wherein the central
2 axis of the socket is not parallel to the longitudinal axis of the stabilizing element.

1 26. A spinal stabilization system comprising:

2 (a) a stabilizing element comprising:

3 (i) a first segment defining a housing in its proximal end,
4 the housing having a ceiling; and

5 (ii) a second segment comprising a piston extending
6 outwardly from its proximal end, the piston extending into the housing;

7 (b) a damping element disposed in the housing between the piston

8 and the ceiling of the housing, wherein the housing is free of damping fluid;
9 (c) a first connector adapted to connect the first segment to a first
10 vertebra in a spinal column;
11 (d) a second connector adapted to connect the second segment to a
12 second vertebra in the spinal column; and
13 (e) a disc prosthesis or disc nucleus replacement disposed between
14 adjacent vertebrae in the spinal column.

1 27. The spinal stabilization system of claim 26, wherein the
2 damping element is a spring.

1 28. The spinal stabilization system of claim 26, wherein the
2 damping element is a elastomeric bumper.

1 29. A spinal stabilization system, comprising:
2 (a) a first flexible rod;
3 (b) a first connector, adapted to connect the first flexible rod to a
4 first vertebra in a spinal column in a manner that allows the rod to translate
5 longitudinally with respect to the first vertebra;
6 (c) a second connector, adapted to connect the first flexible rod to a
7 second vertebra in the spinal column in a manner that prevents the rod from
8 translating longitudinally with respect to the second vertebra; and
9 (d) a disc prosthesis or disc nucleus replacement disposed between
10 two adjacent vertebrae in the spinal column.

1 30. The spinal stabilization system of claim 29, wherein the first
2 flexible rod is capable of rotating in at least one direction at the first connector.

1 31. The spinal stabilization system of claim 29, wherein the first
2 flexible rod is capable of rotating in all directions at the first connector.

1 32. The spinal stabilization system of claim 29, wherein the first
2 flexible rod is locked from either rotation or translation at the first connector.

1 33. The spinal stabilization system of claim 29, wherein the first
2 connector comprises a threaded shaft adapted to penetrate a bone and a head having a
3 bore extending laterally therethrough, wherein the bore has a diameter large enough to
4 allow the first rod to translate through the bore.

1 34. The spinal stabilization system of claim 29, wherein the second
2 connector comprises a pedicle screw, a polyaxial pedicle screw, a lateral mass screw,
3 a hook, or a polyaxial hook.

1 35. The spinal stabilization system of claim 29, further comprising
2 a damping element disposed around the first flexible rod between the first and second
3 connectors.

1 36. The spinal stabilization system of claim 35, wherein the
2 damping element is a spring.

1 37. The spinal stabilization system of claim 29, further comprising
2 a second bias device, the second bias device comprising:

- 3 (a) a second flexible rod;
4 (b) a third connector, adapted to connect the second flexible rod to
5 the first vertebra in a manner that allows the rod to translate longitudinally with
6 respect to the first vertebra;
7 (c) a fourth connector, adapted to connect the second flexible rod
8 to the second vertebra in a manner that prevents the rod from translating
9 longitudinally with respect to the second vertebra.

1 38. A spinal stabilization system, comprising:

- 2 (a) a first damping element adapted to be connected between a first
3 vertebra in a spinal column and a second vertebra in a spinal column;
4 (b) a second damping element adapted to be connected between the
5 first vertebra and the second vertebra; and
6 (c) a disc prosthesis or disc nucleus replacement disposed between
7 two adjacent vertebrae in the spinal column.

1 39. The spinal stabilization system of claim 38, wherein the first
2 and second damping elements are springs.

1 40. The spinal stabilization system of claim 39, wherein the springs
2 are selected from the group consisting of coiled springs, leaf springs, articulated leaf
3 springs, torsional springs, torsional leaf springs, or articulated torsional leaf springs.